

**Project Number**

BDV31-977-64

**Project Manager**

Steve Duke

FDOT Materials Office

**Principal Investigator**

Michele Manuel

University of Florida

## Florida Department of Transportation Research

# Use of Infrared Thermography for the Inspection of Welds in the Shop and Field

February 2018

**Current Situation**

Steel bridges are created by welding steel components. The quality of these welds is critical to the integrity of the bridge. Weld defects can lead to expensive repairs or mechanical failure. However, weld defects are often below the steel surface and in places that are difficult to reach; therefore, the search for improved methods of weld inspection is ongoing.

**Research Objectives**

University of Florida researchers explored the use of infrared ultra-time-domain (IR-UTD) testing as an improved method of inspecting bridge welds.

**Project Activities**

The primary goal of the researchers was to understand the sensitivity of IR-UTD testing to specific types of defects. IR methods work by observing the patterns of heat on the steel surface as the steel is heated. Changes in these patterns can reveal underlying defects, but the patterns can also be affected by the type and location of the heat source. Therefore, to investigate the changes in thermal patterns, it was necessary to test a variety of defects exposed to a variety of heat sources.

Experiments were conducted on a weld specimen with embedded flaws and on steel plate specimens with cut-outs to represent flaws. These specimens were heated by four methods: a pair of industrial infrared heat lamps; a laboratory oven; 45,000-BTU propane torches; and a heating coil in direct contact with the specimen. A specialized test frame was constructed to provide a stable platform for the experiments and to position heat sources to test directional heating.

The goal of these exploratory laboratory studies was to demonstrate the capability of IR-UTD testing to detect weld defects. The results were promising, and improvements in the technique were made that require further and more extensive testing. These laboratory studies laid a foundation for the next step: using IR-UTD testing in a welding shop.

**Project Benefits**

Improved methods of weld inspection can help assure the structural integrity of bridges and prevent costly maintenance and repair and service interruptions.

*For more information, please see [www.fdot.gov/research/](http://www.fdot.gov/research/).*



*The massive steel structures that combine to create bridges depend in large part on quality welds for their structural integrity.*